AIRS TVAC TESTS RESULTS

T. Pagano

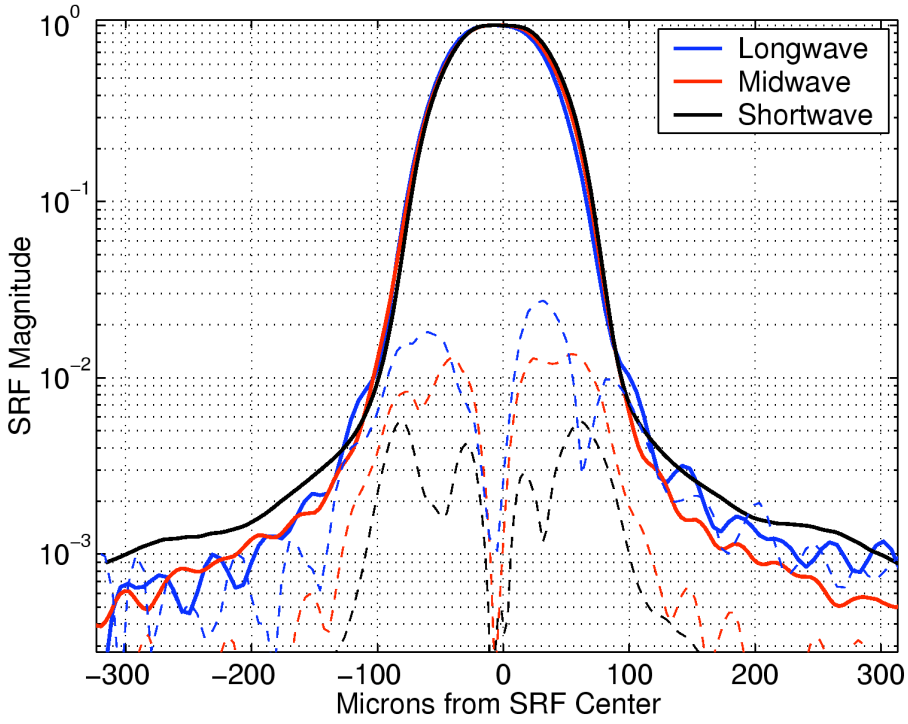
Wednesday, February 13, 2002

AGENDA

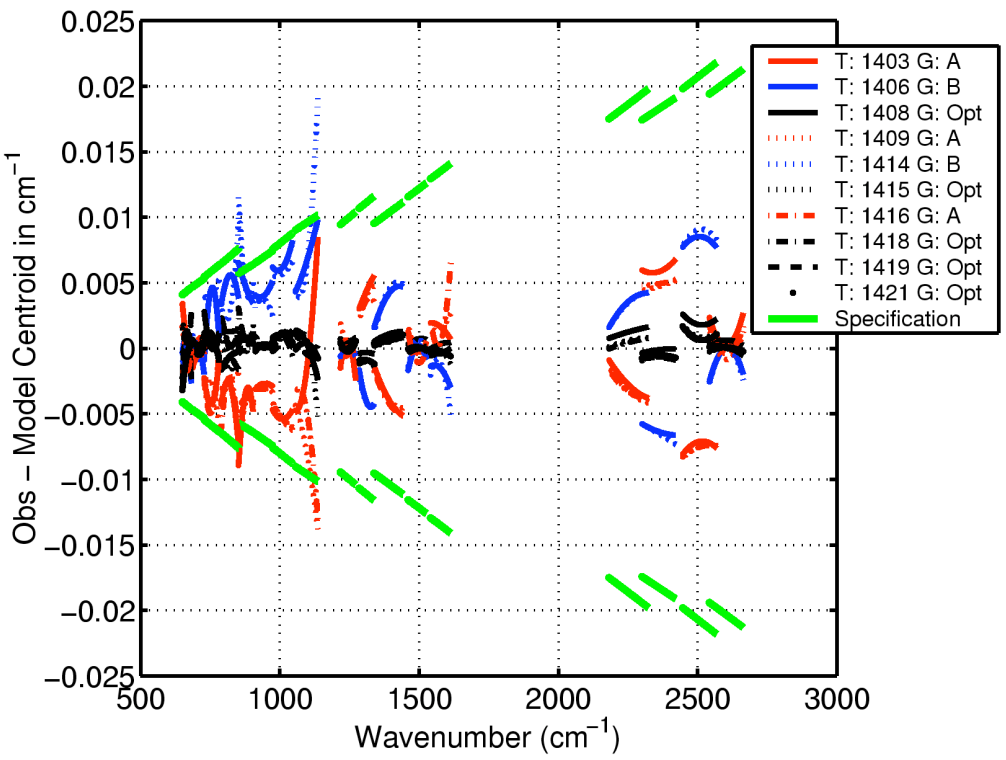
- **Pre-flight Testing at BAE SYSTEMS**
  - ***Spectral Calibration***
  - ***Radiometric Calibration***
- **Pre-flight Testing at TRW**
  - ***Special Tests Dry run for In-Flight Calibration***
  - ***System Comprehensive Performance Tests Results***

PREFLIGHT SPECTRAL CAL SHOWS EXCELLENT SPECTRAL SHAPE AND STABILITY

SRF Shape Well Characterized to <10^{-3}



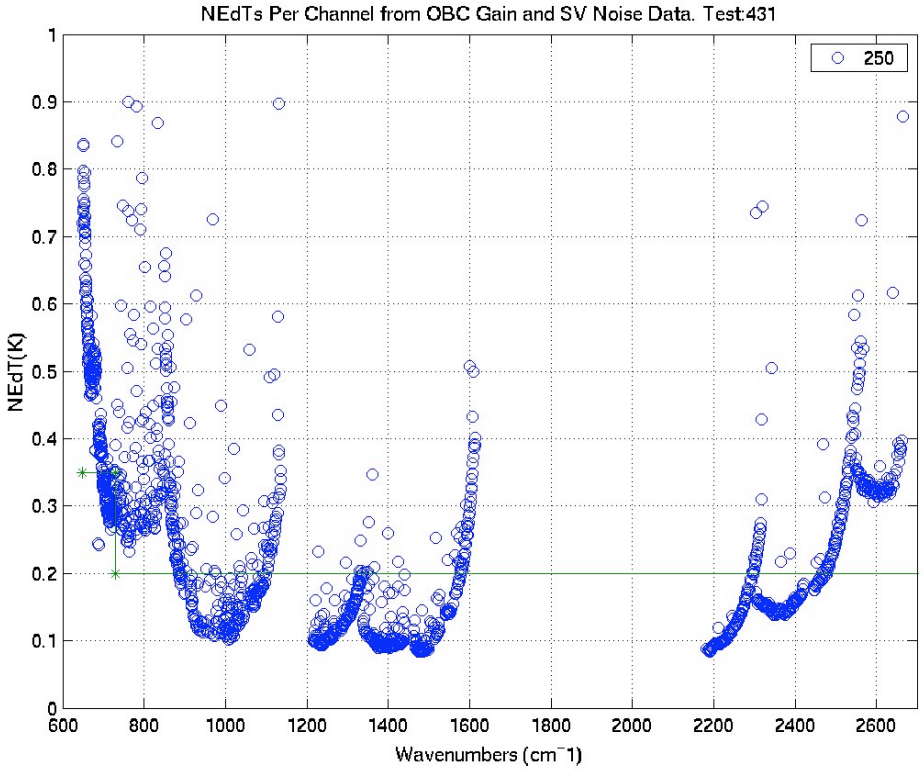
Knowledge of Centroids Within Spec Limits



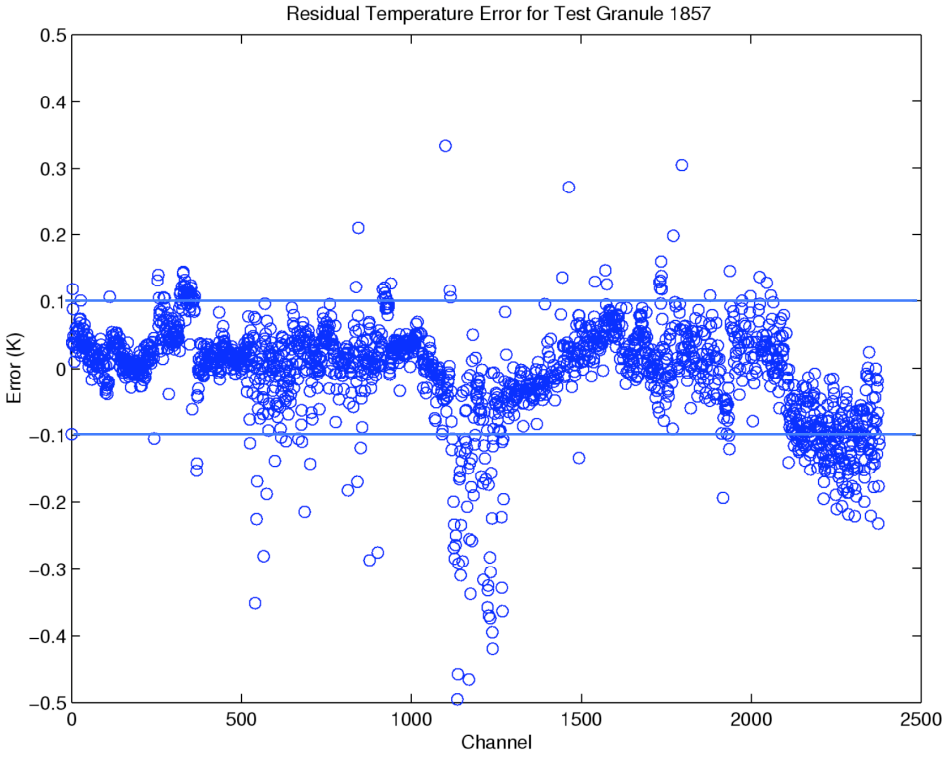
Temperature Dependence Well Behaved

PRE-FLIGHT RAD CAL SHOWS EXCELLENT RADIOMETRIC SENSITIVITY AND ACCURACY

NEDTs ARE GOOD



SYSTEMATIC CAL ERRORS < 0.1K FOR MOST CHANNELS



SPECIAL CALIBRATION TEST SEQUENCES (STS) A KEY ELEMENT OF IN-FLIGHT CAL PLAN

- **Transfer pre-flight calibration to in-orbit configuration**
  - *Same tests performed pre-flight at TRW and in-orbit*
  - *Tests are traceable to pre-flight calibration using NIST traceable sources*
  - *Check location of spectral response functions*
  - *Re-establish instrument linear radiometric response*
- **Discover and quantify potential new sources of stray light and noise**
  - *Stray light in the space viewport*
  - *Determine orbital dependence of noise*
  - *Set Radiation Circumvention Levels*
- **Correct for launch environmental changes**
  - *Adjust AMA for AB Balance and Spectral Centering*

TWELVE SPECIAL TEST OBTAIN KEY MEASUREMENTS

Test ID	Name	Description	Measurement Obtained
AIRS-C1	Normal Mode / Special Events	Establish normal DCR and Lamp operation. Flag data for special events Earth Scene targets of opportunity.	Focal Plane Model Geolocation SST Acquisitions
AIRS-C2	Guard Test	Cycles through A, B and A/B Optimum Gains and acquires data.	Radiometric Gains NEdT Spectral FP Model (Parylene)
AIRS-C3	Channel Spectra Phase	Heat and cool spectrometer by ±1K	Phase of Channel Spectra
AIRS-C4	AMA Adjust	AMA is moved to the desired x (spatial) and y (spectral) position.	AB Balance Spectral Adjust
AIRS-C5	OBC Cool	Blackbody heater is turned off	IR Linearity
AIRS-C6	Variable Integration Time	Integration time is varied on readout while scanning	Electronics Linearity
AIRS-C7	Space View Noise	The scan mirror is stopped and parked at OBCs	Noise Behavior (Pops, FPN, etc) Drift Characterization
AIRS-C8	Radiation Circumvention	Same test as AIRS-C7 but with radiation circumvention turned on.	Threshold Levels
AIRS-C9	Scan Profile	Slow part of scan rotated to OBCs	Stray Light Calibrator Centration
AIRS-C10	Lamp Operations	Each of the three lamps are exercised by user command.	VIS Gains, VIS Noise
AIRS-C11	Warm Functional	Focal Plane Power is Cycled Test Pattern Gain Table Loaded	FPA Functionality Data Stream Verification
AIRS-C12	Cold Functional	Same as AIRS-C11 except performed cold.	FPA Functionality

☐ System Comprehensive Performance Tests (SCPT)

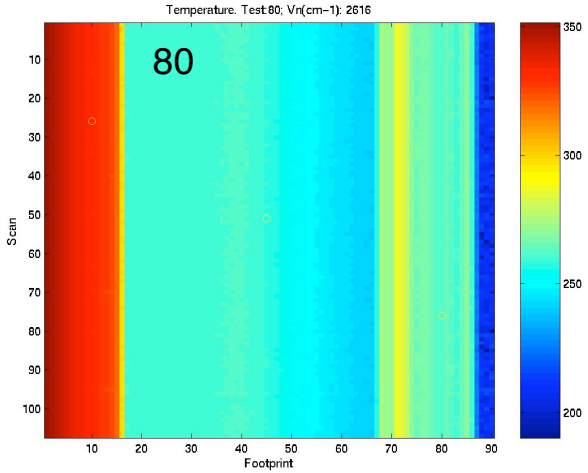
TEST IDs OBTAINED AT TRW FOR ALL SCPT TESTS

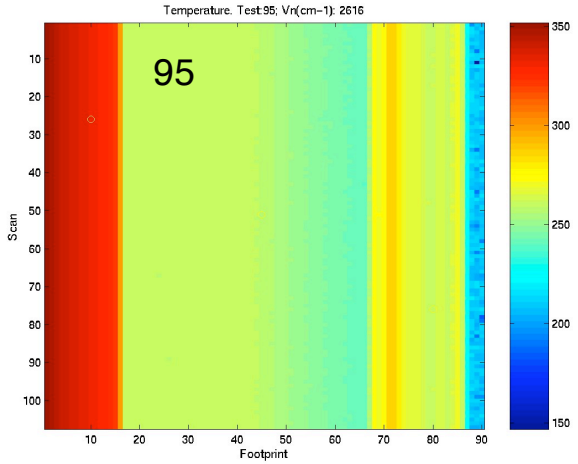
Test	Function	SCPT1	SCPT2	SCPT3	SCPT4
AIRS-C1	Normal Image	80	95	264	306
AIRS-C2	Gains	78	92	262	304
AIRS-C7	Noise	64	94	260	302
AIRS-C10	Vis/NIR	56	93	266	301

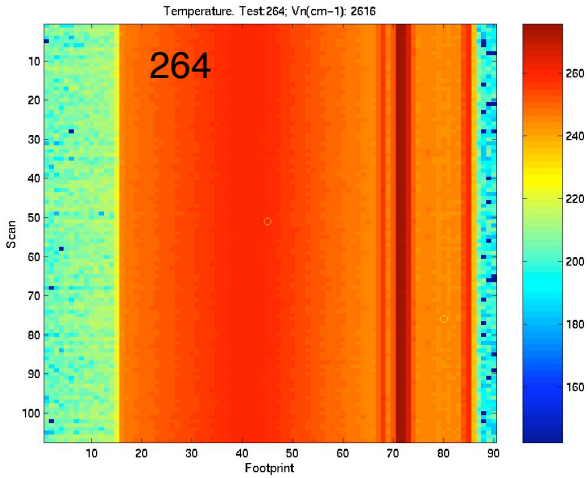
All SCPT tests referenced to test 1869 performed at BAE SYSTEMS

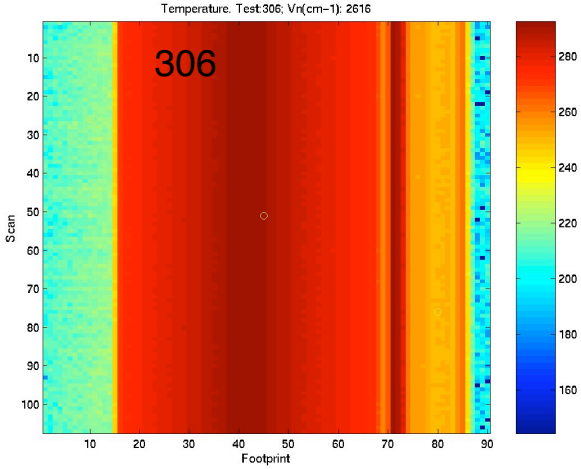
For more information on the TRW SCPT Tests see:
"AIRS System Copmprehensive Performance Test (SCPT) Calibration Sequence Trending Results from TRW TVAC", T. Pagano, ADF 553, December 10, 2001

SCPT C1: NORMAL MODE IMAGERY EVALUATION





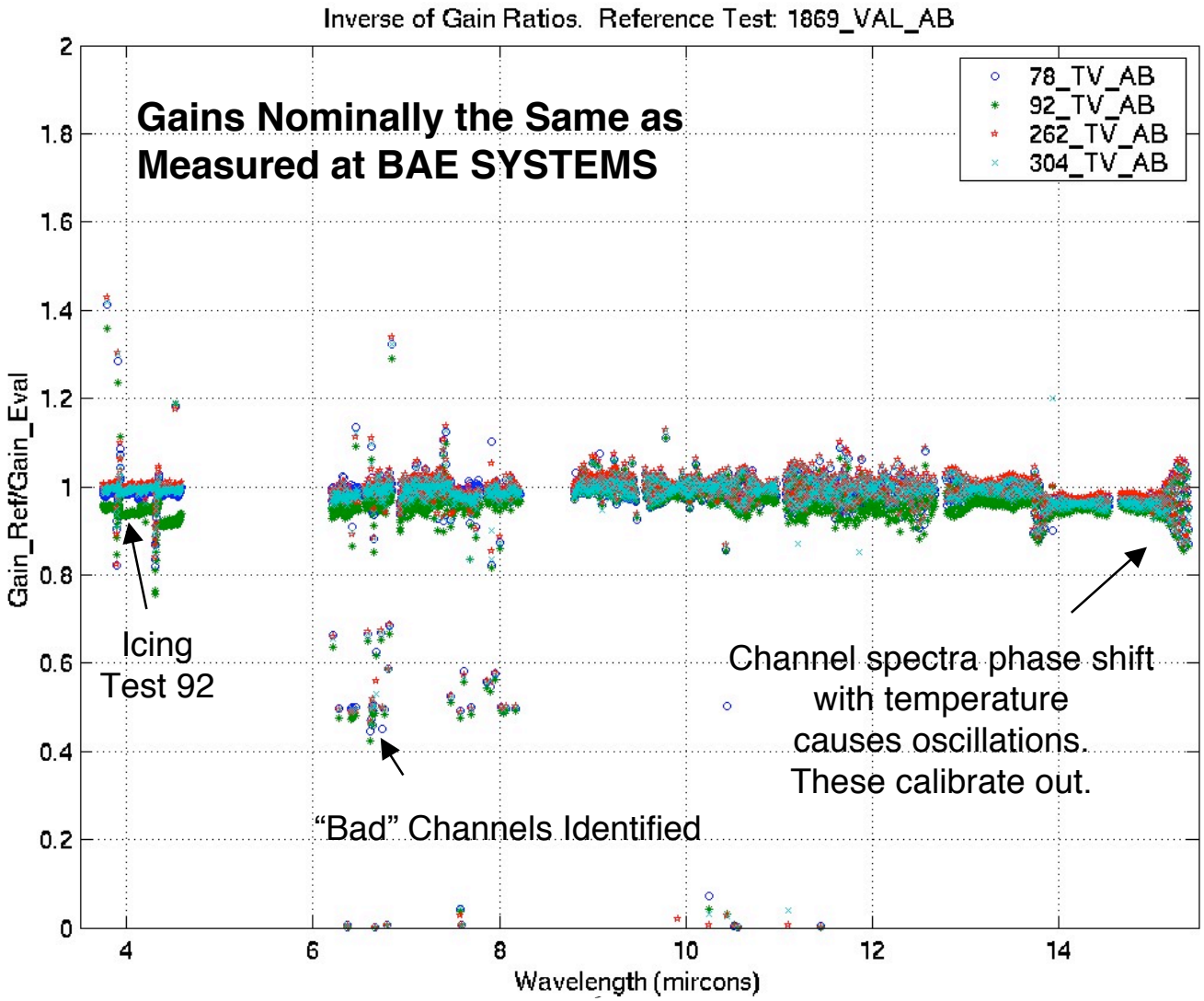




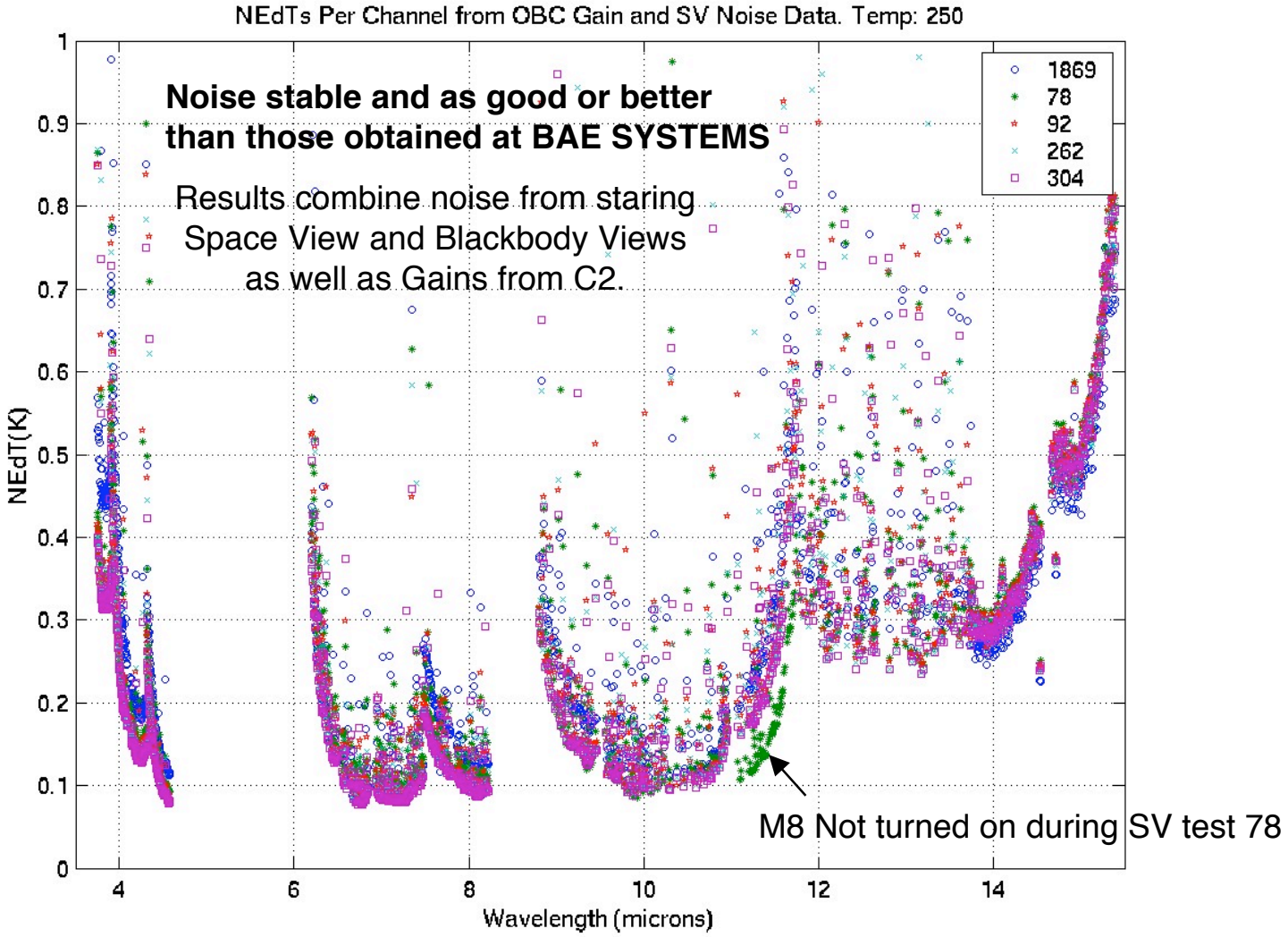
Images look good

- No Fixed Pattern Noise
- No residual DCR effects
- Good Dynamic Range
- Good SNR
- No quantization effects

SCPT C2: "GUARD" TEST EVALUATES AIRS RESPONSIVITY (GAIN)



SCPT C7: EVALUATES NOISE PERFORMANCE



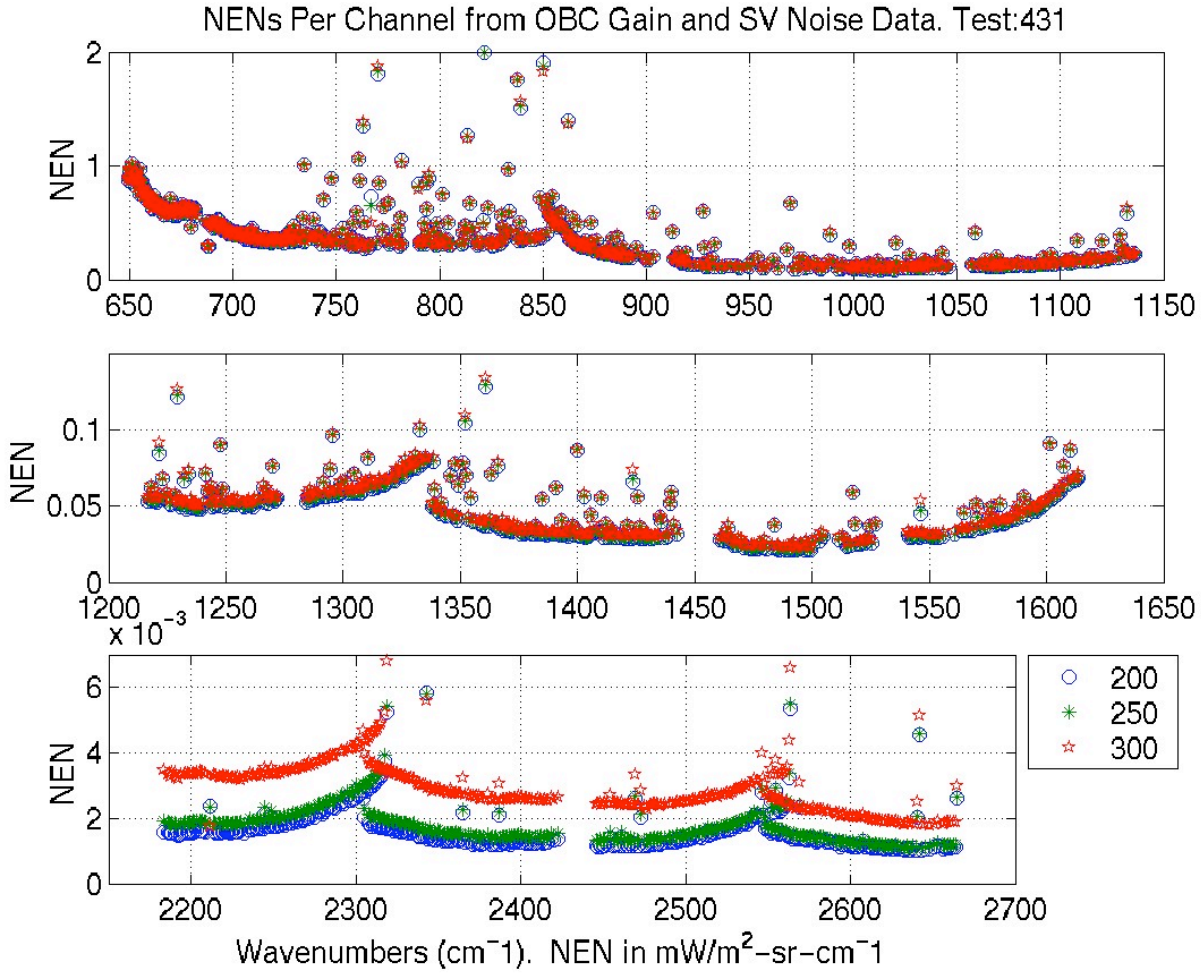
C7: SOME SCENE DEPENDENCE OF NENS FOR M1 AND M2

Noise data acquired staring at OBC and SV independently give signal dependence on noise

Detector Noise Limited M5-M12

Detector Noise Limited M3, M4

Photon Noise Limited M1, M2



Algorithm Provided on AIRS Calibration Web Page airsteam.jpl.nasa.gov/calibration

SCPT C10: VIS CHANNEL SNRs LOOK GOOD AND STABLE